Studying the Public School Environment and Classroom Indoor Air Quality:

Community-based Exposure Assessments Through Public-Private-Government "Partnerships," Examples from CA and TX

Derek G. Shendell, MPH, D.Env. Candidate
Environmental Science &Engineering Program,
UCLA School of Public Health
Lawrence Berkeley National Laboratory-Indoor Env. Dept

OTHER AUTHORS

- Janice Kim and Svetlana Smorodinsky,
  CalEPA-OEHHA
- Peggy Jenkins, CARB
- Jed M. Waldman, CA DHS
- Richard L. Corsi and Vince Torres,
  UT-Austin/TX Institute for the Indoor Env.
- Michael G. Apte, LBNL

ACKNOWLEDGEMENTS

Other Researchers and Staff

- CalEPA-OEHHA

Dr. Bart Ostro

Dr. Michael Lipsett

- UC-B, SRC

Donna Eisenhower, Jackie Hayes

- UT-Austin/TX IIE

Mark Sanders, Kerry Kinney

- CA DHS

Bob McLaughlin, Paul English; IAQ Program staff

- RTI, NC

- CARB

Tom Phillips; Indoor Air Quality & Personal Exposure Assessment Program staff

- LBNL (EETD/IED)

Bill Fisk, Al Hodgson, Dr. Brett Singer, Doug Sullivan, Dennis DiBartolomeo, Tosh Hotchi, Dr. Seung-Min Lee, students

- Davis Energy Group

Dr. Leo Rainer

ACKNOWLEDGEMENTS

Funding Sources

- U.S. EPA STAR Graduate Fellowship Program, # U91-5394

- California Energy Commission, HPCBS Program

- Texas Higher Education Coordinating Board, using TX tobacco settlement funds

- State of California, through specific legislation

OUTLINE OF PRESENTATION

- Background
- IAQ and school environment studies, CA and TX
- Effective “partnerships” for exposure assessment research at public schools
- Overall conclusions

THE SCHOOL ENVIRONMENT

Surrounding outdoors

- nearby stationary sources
- nearby or adjacent mobile/line sources
- construction activities
- historical land use
- playground EH&S

Classroom IAQ, IEQ

- traditional versus portables, RCs
- potential physical, chemical, biological and infectious risks
- where majority of 6.25-7 hr day spent
- where students 5-18 are 10 to 12.5% of life

ISSUES FACING OUR NATION'S PUBLIC SCHOOLS

- Class size reduction policies, federal & state

- Limited financial, technical resources for modernization and O&M at aging schools

- Growing student population-- immigration

- Lack of land for expansion; historical land use

ISSUES FACING OUR NATION'S PUBLIC SCHOOLS (continued)

- Concern over pesticide applications inside and out
- CA electricity crisis; higher natural gas prices
- Academic achievement, student health/services
- Insurance/liability issues in EH&S

THE ROLE OF INDOOR AIR / ENVIRONMENTAL QUALITY (IAQ, IEQ)

Good IAQ, IEQ =

- student, teacher and staff health, safety, and productivity
- ventilation with filtered outdoor air
- energy efficiency

IAQ and SCHOOL ENVIRONMENT STUDIES in CA and TX

- UCLA SPH pilot "Portable Classrooms Study"
- LBNL/DEG Relocatable Classroom Study
- CalEPA-OEHHA/LBNL/UC-B SRC/CADHS, "East Bay Children's Respiratory Health Study"
- CARB/CADHS/RTI, "The California Portable Classrooms Study"
- UT-Austin/TX IIE, "Texas Elementary School Indoor Air Study"

STUDY GOAL, BASIC DETAILS

UCLA SPH pilot "Portable Classrooms Study"

- Conduct quantitative monitoring of toxic chemical exposures and air exchange rate measurements, and qualitative technician walk-through surveys and questionnaires with head custodians, to gain a basic scientific understanding of the school environment and portable classroom IAQ in L.A. County, CA.

- Two SD, 7 schools; 13 portables, 7 main building control classrooms
- Two sampling periods/seasons, field work conducted 6/2000-6/2001

STUDY GOAL, BASIC DETAILS

Relocatable Classroom Study, IEQ and energy

- Demonstrate, in N. CA context, designs with simultaneous energy efficiency gains and good IEQ.

- One RC manufacturer, two SD, one elementary school in each SD

- Two prototype RC-- with two HVAC units installed-- at each school

- Case-crossover design; HVAC operate on alternate weeks; IEQ and energy use monitoring 8-9 weeks in cooling and heating seasons, 2001-02

STUDY GOAL, BASIC DETAILS

"East Bay Children's Respiratory Health Study"

- Evaluate association between child respiratory health--3rd-5th graders-- and modeled/estimated exposure to traffic related pollutants at elementary schools and adjacent residential neighborhoods.

- Cross-sectional study; base/study pop. = 1600/1100; 3 SD, 10 schools
- Self-administered Qx-- with parent-- on child health and the home
- Teacher Qx on classroom, technician walk-through surveys
- Air monitoring
  - long-term outdoor averages, one week indoors for one class/school
  - CO, PM10, PM2.5 (mass, EC), NO2/N0x; VOCs, T°, RH%

STUDY GOAL, BASIC DETAILS

The California Portable Classroom Study

- Examine environmental health conditions in portable classrooms at CA public schools; identify those conditions which are unhealthful, and then recommend actions, in consultation with stakeholders, for remedies and prevention.

- Two phases-- 4-6/2001, 8/2001-3/2002
- Random selection at school and classroom levels for consenting SD
- Two portables, one main building classroom per school
- Qx for teachers and facility managers, technician assessments
- IEQ and outdoor air monitoring; only passive H2CO in phase I

STUDY GOAL, BASIC DETAILS

Texas Elementary School Indoor Air Study, TESIAS

- Assess school conditions and teacher/staff perceptions of IEQ in central TX and the southern "border region."

- 4/2000-8/31/01, two SD, 30 elementary schools by random selection
- Qx to 900 teachers, 400 staff; technician walk-through survey
- IEQ: CO2, CO, Tº, RH%, PM2.5, VOC, air live/surface mold, bacteria

- Low [VOCs], reasonably high [PM2.5], **poor ventilation** with filtered outdoor air-- PM2.5, odors

COMMON DENOMINATOR

Community-based research studies with public-private government “partnership”

WHAT IS MEANT BY A PUBLIC-PRIVATE-GOVERNMENT "PARTNERSHIP?"

- "Partnerships" can be
  - collaborations within and among agencies, state and national laboratories, university researchers
  - cooperation with public stakeholders
  - contractual agreement-- field work, lab analyses
  - by government mandate for research, development, demonstration, evaluation

FORMING EFFECTIVE COLLABORATIONS

- What should researchers, administrative staff, and field technicians know and be sensitive to?
  - Local context, i.e., community and its people
  - Current EH&S and IAQ issues at target or participant school districts, schools
  - Perceptions/misperceptions, liability concerns
  - Administrative structure of SD, schools

FORMING EFFECTIVE COLLABORATIONS (continued)

- To what should researchers, administrative staff, and field technicians be aware/sensitive, with respect to private sector collaborators/interests?
  - Products have general and/or specific uses, labels
  - Human behavior and error in installation, operation and maintenance must be recognized and accepted
  - Liability concerns; driven mainly by profit
  - Genuine interest in public EH&S and quality exists!

    Good business = satisfied, returning customers, i.e., quality products and services, good safety and performance records

OVERALL CONCLUSIONS

Lessons Learned, Preliminary Recommendations

- Effective, and politely repeated, communication and coordination with schools in planning and implementing a study, e.g., field work, “incentives”

- Collaborators at SD and schools should be viewed as equals during planning and at school sites; school environment exposure and IEQ assessment process is dynamic. They work hard, and have good ideas.

OVERALL CONCLUSIONS (continued)

Lessons Learned, Preliminary Recommendations

- Gain local knowledge, scout target communities--languages, safety, environment factors/covariates

- Study design, timeline = f(logistics, SD calendar)

- Qx and technician surveys must fit needs/goals of each study, but consistency with other school environment and IEQ assessments is important to build a database on public school facilities

OVERALL CONCLUSIONS (continued)

Lessons Learned, Preliminary Recommendations

- Recommendations for remedies and prevention must be based on the best available scientific data, including surveys, with an understanding of:

  – the influence of human behavior

  – climate zone attributes

  – advice from interested, knowledgeable parties